

districts was interrupted by an area of low barometer which advanced from the west part of the Gulf of Mexico northeastward during the last three days of the month. Ample warnings of the approach of this cold wave were issued in all districts which it visited. Special warnings telegraphed well in advance of the cold wave throughout the Pacific coast and Rocky Mountain districts prompted precautionary measures which resulted in saving large quantities of perishable products. Heavy snow preceded the advance of this cold wave in many of the districts, concerning which ample warnings were given. On the morning of the 29th snow, melting as it fell, was reported at Riverside, Cal.

#### BOSTON FORECAST DISTRICT.

The storms of the month were not destructive, as the high winds experienced were offshore or westerly winds. Timely warnings were displayed well in advance of the high winds, and the changes in weather and temperature were, as a rule, accurately forecast.—*J. W. Smith, Forecast Official.*

#### NEW ORLEANS FORECAST DISTRICT.

Cold-wave warnings were issued for portions of the district on the 3d, 10th, 20th, 23d, 24th, 26th, and 27th. The warnings were generally timely and no cold waves occurred without warnings. No severe windstorms occurred during the month. The daily forecasts have given general satisfaction, and favorable comments on the work of the Bureau are heard on all sides.—*I. M. Cline, Forecast Official.*

#### CHICAGO FORECAST DISTRICT.

A severe cold wave covered the entire district during the 26th and 27th. Warnings were issued for all points well in advance of its approach. Winter navigation continued on Lake Michigan during the month. Occasional high winds occurred and messages were sent to all open ports, advising vessel interests of the storm. No casualty occurred during the month, except the grounding on the bar near the mouth of the Ludington Harbor of the car ferry *Pere Marquette* on the night of the 13-14th. Navigation was seriously impeded along the west shore of Lake Michigan by extensive fields of ice during the latter part of the month.—*H. J. Cox, Professor.*

#### DENVER FORECAST DISTRICT.

On the night of the 24th cold-wave warnings were ordered in Utah, western Colorado, and northern New Mexico. On the morning of the 25th cold-wave warnings were given general distribution in Utah and western Colorado, and to points in central and eastern Arizona and southeastern Colorado. A few hours later the following message was given general distribution in Colorado:

Conditions favorable for severe cold and high northerly winds, with heavy snow in mountain districts.

These warnings were issued well in advance of the cold and were fully justified, except in parts of Arizona and New Mexico.—*F. H. Brandenburg, Forecast Official.*

#### SAN FRANCISCO FORECAST DISTRICT.

The month continued dry, with frost general in California until the 16th, when rain fell from San Francisco northward.

The night of the 24th cold-wave warnings were ordered for central and northern California and Nevada. Emergency frost warnings were issued for all points in southern California on the morning of the 25th in ample time to be of service to the orange growers, and emergency frost warnings for southern California were again issued on the morning of the 29th and were verified. Frost warnings were issued on the morning of the 30th. No storms of exceptional severity occurred during the month.—*Alexander G. McAfee, Professor.*

#### PORTLAND, OREG., FORECAST DISTRICT.

On the morning of the 24th a severe cold wave made its appearance in the British Possessions north of Montana. Special reports showed that the cold wave was moving rapidly toward the district and the following cold-wave warning was at once sent to stations east of the Cascade:

Cold wave. Temperature will fall 20° by morning and zero weather will continue several days.

Storm northeast warnings, containing the additional announcement of much colder weather with snow, were sent to all storm warning display stations. The cold-wave warnings were timely and verified in detail, each station being advised about twenty-four hours in advance of the arrival of the cold wave.—*Edward A. Beals, Forecast Official.*

#### AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

| Number.                | First observed. |         |          | Last observed. |         |          | Path.   |           | Average velocity. |         |
|------------------------|-----------------|---------|----------|----------------|---------|----------|---------|-----------|-------------------|---------|
|                        | Date.           | Lat. N. | Long. W. | Date.          | Lat. N. | Long. W. | Length. | Duration. | Daily.            | Hourly. |
| <b>High areas.</b>     |                 |         |          |                |         |          |         |           |                   |         |
| I.....                 | 1, a. m.        | 54      | 114      | 7, a. m.       | 47      | 65       | 3,450   | 6.0       | 575               | 24.0    |
| II.....                | 8, p. m.        | 41      | 124      | 10, a. m.      | 43      | 104      | 1,200   | 1.5       | 800               | 33.3    |
| III.....               | 12, a. m.       | 50      | 97       | 15, a. m.      | 32      | 65       | 2,900   | 3.0       | 967               | 40.3    |
| IV.....                | 15, a. m.       | 48      | 115      | 18, p. m.      | 46      | 78       | 1,800   | 1.5       | 1,200             | 50.0    |
| V.....                 | 15, a. m.       | 43      | 116      | 18, p. m.      | 32      | 65       | 3,550   | 3.5       | 1,014             | 42.3    |
| VI.....                | 17, a. m.       | 41      | 124      | 21, a. m.      | 46      | 60       | 3,750   | 4.0       | 938               | 39.1    |
| VII.....               | 19, p. m.       | 37      | 122      | 23, p. m.      | 30      | 82       | 3,400   | 4.0       | 850               | 35.4    |
| VIII.....              | 24, a. m.       | 54      | 114      | 1, p. m.*      | 46      | 60       | 3,775   | 8.5       | 444               | 18.5    |
| Sums.....              |                 |         |          |                |         |          | 23,825  | 32.0      | 6,788             | 282.9   |
| Mean of 8 paths.....   |                 |         |          |                |         |          | 2,978   |           | 848               | 35.4    |
| Mean of 32.0 days..... |                 |         |          |                |         |          |         |           | 746               | 31.1    |
| <b>Low areas.</b>      |                 |         |          |                |         |          |         |           |                   |         |
| I.....                 | 1, a. m.        | 51      | 104      | 4, a. m.       | 47      | 54       | 2,500   | 3.0       | 833               | 34.7    |
| II.....                | 5, p. m.        | 54      | 114      | 7, p. m.       | 48      | 86       | 1,300   | 2.0       | 650               | 27.1    |
| III.....               | 7, a. m.        | 52      | 114      | 10, p. m.      | 48      | 68       | 2,600   | 3.5       | 743               | 31.0    |
| IV.....                | 10, a. m.       | 37      | 87       | 13, a. m.      | 49      | 64       | 1,950   | 3.0       | 650               | 27.1    |
| V.....                 | 10, p. m.       | 46      | 84       | 13, p. m.      | 49      | 64       | 1,350   | 2.5       | 540               | 22.5    |
| VI.....                | 13, p. m.       | 54      | 114      | 20, a. m.      | 47      | 54       | 3,100   | 4.5       | 689               | 28.7    |
| VII.....               | 16, a. m.       | 37      | 80       | 17, a. m.      | 32      | 65       | 1,300   | 1.0       | 1,300             | 54.2    |
| VIII.....              | 16, p. m.       | 37      | 114      | 18, p. m.      | 32      | 86       | 1,700   | 2.0       | 850               | 35.4    |
| IX.....                | 18, a. m.       | 43      | 124      | 23, p. m.      | 48      | 63       | 3,900   | 5.5       | 709               | 29.5    |
| X.....                 | 24, a. m.       | 47      | 123      | 23, p. m.      | 36      | 87       | 2,600   | 2.5       | 1,040             | 43.3    |
| X.....                 | 26, a. m.       | 47      | 89       | 27, a. m.      | 48      | 63       | 900     | 1.0       | 900               | 37.5    |
| Sums.....              |                 |         |          |                |         |          | 23,200  | 30.5      | 8,904             | 371.0   |
| Mean of 11 paths.....  |                 |         |          |                |         |          | 2,109   |           | 809               | 33.7    |
| Mean of 30.5 days..... |                 |         |          |                |         |          |         |           | 761               | 31.7    |

\*February.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*Geo. E. Hunt, Chief Clerk, Forecast Division.*

#### RIVERS AND FLOODS.

The stages of the Missouri and upper Mississippi rivers varied but little during the month. The lower Mississippi